

Piezoelectrical Structural Sensor Technology for Extreme Environments (> 1800 F), Phase I

Completed Technology Project (2009 - 2009)



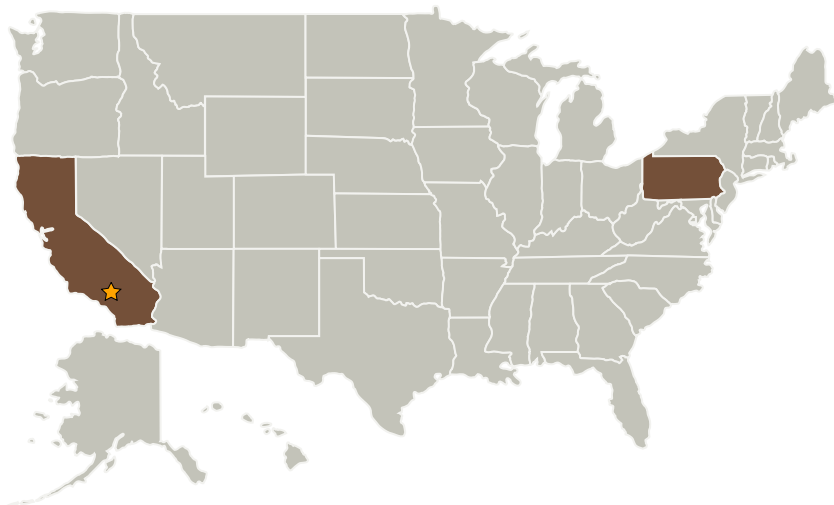
Project Introduction

High temperature piezoelectric crystal (HTP) sensors are desired for future propulsion component structure health monitoring, operating parameters optimization, turbine engine control and health monitoring, as well as improving performance and maintainability of power production facilities and other rotary combustion engines. Recently discovered high temperature piezoelectrics showed stable piezoelectric properties and high resistivity at temperatures close to its melting point (~ 1500 C), which is very promising for high temperature sensor applications. The preliminary results showed excellent temperature sensing performance at temperature up to 1000 C. Piezoelectric structural sensors on the basis of piezoelectric effect (non-resonant) and impedance measurement (resonant) have been widely demonstrated for pressure, stress, strain, temperature, acceleration, etc. measurements because of their high sensitivity, quick response, low profile, high reliability and low cost. The goal of this program is to develop highly sensitive HTPC based piezoelectric structural sensors for temperature, strain and acceleration measurements at temperatures up to 2000 oF.

Anticipated Benefits

High temperature sensors can be used for turbine engine control and health monitoring, high mach flight tests, as well as improving performance and maintainability of power production facilities and other rotary combustion engines.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
TRS Ceramics, Inc.	Supporting Organization	Industry	State College, Pennsylvania

Primary U.S. Work Locations	
California	Pennsylvania

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Larry D Hudson

Principal Investigator:

Xiaoning Jiang

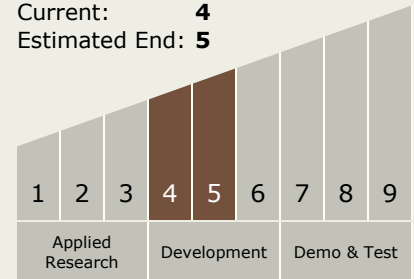
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Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.4 Environment Sensors